

## NORTH PACIFIC OCEAN

By WILLIS E. HURD

It was noticeable in the latter part of September that a slight weakening was taking place in the North Pacific anticyclone. On the north the Gulf of Alaska extension of the Aleutian low was beginning to penetrate it more deeply as the month advanced. On the east, in the last decade, a low pressure-area of the winter type entered its boundaries and for two or three days lay off the California coast; and on the west an early winter type of cyclone encroached upon the high, remaining in the neighborhood of Midway Island from the 26th to 28th, and giving moderate to strong gales in its western quadrants.

In higher latitudes the Aleutian cyclone showed signs of increasing development, especially to the eastward of the Alaskan Peninsula, where, for the first time since April, pressure had fallen below 29 inches on a given day. The center of this cyclone continued near Kodiak, where it had been located during most of the preceding months of the year.

Pressure data for several island and American coast stations are given in the following table:

TABLE 1.—Averages, departures, and extremes of atmospheric pressure at sea level at indicated hours, North Pacific Ocean, September, 1928

Stations	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Inches	Inch	Inches		Inches	
Dutch Harbor <sup>1,2</sup>	29.85	+0.09	30.32	9th	29.22	11th.
St. Paul <sup>1,2</sup>	29.82	+0.12	30.44	30th	29.08	6th.
Kodiak <sup>1,2</sup>	29.66	-0.04	30.06	3d <sup>3</sup>	28.80	11th.
Midway Island <sup>1</sup>	30.00	-0.07	30.20	10th	29.68	27th.
Honolulu <sup>4</sup>	30.01	+0.01	30.09	1st	29.89	25th.
Juneau <sup>4</sup>	29.94	+0.02	30.32	6th	29.12	13th.
Tatoosh Island <sup>4,5</sup>	30.04	+0.03	30.29	20th	29.71	11th.
San Francisco <sup>4,5</sup>	29.94	0.00	30.18	30th	29.70	19th.
San Diego <sup>4,5</sup>	29.87	+0.02	30.04	30th	29.63	19th.

<sup>1</sup> P. m. observations only.

<sup>2</sup> For 28 days.

<sup>3</sup> For 29 days.

<sup>4</sup> A. m. and p. m. observations.

<sup>5</sup> Corrected to 24-hour mean.

<sup>6</sup> Also on 26th.

In Asiatic waters atmospheric conditions were marked throughout the month by a great number of depressions, together with several active cyclones from oceanic and continental sources. A report of the typhoons in tropical waters by the Rev. José Coronas, S. J., is subjoined.

With the increase of cyclonic activity over the ocean since August, a slight increase occurred in the number and extent of gales, especially in middle latitudes, and during the last days of the month. Along the upper trans-Pacific steamship routes, however, the weather could not yet be called stormy as a whole, since the maximum force of the gales reported did not exceed 9, the heavier winds being confined to lower latitudes. Only one of our marine observing vessels yet heard from passed through the violent portion of a typhoon. This was the American steamer *Everett*, which sustained some damage in the Eastern Sea on the 13th from the same intense typhoon that devastated Shanghai on the following day.

In Mexican tropical waters three known cyclones, one a hurricane, occurred this month.

The earliest originated on the 1st not far from 14° N., 109° W., and moved in a west-northwesterly direction until the 3d, when it was lost to observation near 20° N., 121° W. The path of this cyclone lay close to, and for a

part of the time between, the courses of two American steamers, the *Santa Isabel* and the *Chattanooga City*, which were en route from the Canal to Honolulu. The lowest observed pressure was 29.44 inches, read on board the *Santa Isabel* on the 3d, in 17° 52' N., 117° 12' W. The highest wind force, WSW., 10 plus, was reported by the *Chattanooga City* on the 2d in 16° 17' N., 115° 50' 50' W.

On the 13th westerly to northwesterly gales of moderate force occurred south of the Gulf of Tehuantepec, but whether of the norther or of the cyclonic type is not now determined. Lowest observed pressure 29.78 inches.

On the 20th to 22d westerly to northwesterly winds of force 8 were met with in nearly the same location in conjunction with a known cyclonic disturbance which occasioned bad weather between Salina Cruz and Acapulco.

The hurricane of the month seems to have formed some 200 miles west-southwest of Acapulco on the 17th. It moved northwestward within a huge depression which covered most of the western coast region of Mexico, all of Lower California, and adjacent waters, and on the 18th and 19th caused hurricane winds over the lower waters of the Gulf of California south of Mazatlan. On the 20th whole gales occurred in nearly the same region, but on the 21st the cyclone, with much lessened intensity, curved northeastward and entered the coast above Mazatlan. It is interesting to note that it crossed Mexico in an east-northeast direction as a mere depression and entered the Gulf of Mexico below Brownsville on the 22d. For several days it disturbed the weather slightly over the western part of the gulf, but had disappeared by the end of the month.

Compared with its sudden great acceleration in speed overland, its rate of progression was extraordinarily slow on the 18th to 20th, when its average forward movement was scarcely more, perhaps, than 2 or 3 miles an hour. During this time at differing hours and places the directions of the hurricane winds seem to indicate that it had periods of retrogression and recovery, or that the center was quite elongated. The barometric depth of the storm was considerable, especially during the 18th and 19th, when it was below 29 inches. The minimum reading was 28.82 inches, made on board the British steamer *Goodwood* at 2 a. m. of the 19th, in 19° 58' N., 106° 58' W. The American steamer *Maine*, Balboa to San Pedro, entered the zone of hurricane velocities at 7 p. m. of the 18th—noon position 19° 08' N., 106° 04' W.—and left it at 5 p. m. of the 19th—noon position 19° 56' N., 107° 19' W.—the wind meanwhile changing from north-northwest into north and back through north into west, covering a period of 22 hours during which the vessel was in the heaviest of the storm. She experienced winds of gale force from late on the 17th until 1 a. m. of the 20th.

Reports of a number of vessels involved in the several cyclones off the Mexican coast are given in the table.

Up to the end of September 7 cyclones are known to have occurred in these waters this year—2 in June, 1 each in July and August, and 3 in September. Three of the number were hurricanes.

At Honolulu easterly trades prevailed on all but one day. They were stronger than usual for the month, the hourly velocity averaging 9.1 miles. The maximum velocity was at the rate of 24 miles, from the east, on the 5th.

The number of days with fog decreased over the western half of the upper sailing routes since August, but increased

over the eastern half, so that the frequency of formation was about the same in both regions, ranging from 10 to 25 per cent. Along the American coast fog was observed most frequently between Vancouver and Cape San Lucas, the highest percentage, 30 to 35, being between the thirtieth and fortieth parallels.

*Whirlwind.*—Mr. William J. Rae, third officer of the Canadian steamer *City of Victoria*, Capt. J. MacPhail, Pacific coast toward China, reports as follows:

Tuesday, September 25, 9:30 a. m., apparent time at ship in latitude  $37^{\circ} 50'$  N., longitude  $134^{\circ} 30'$  E., experienced a miniature tornado or whirlpool. It approached ship stern on from SW.  $\frac{1}{2}$  W. (true), about 150 feet diameter, visible on water below a patch of heavy A. Cu. clouds in squall form, all moving with anticlockwise motion. It passed from stern over ship off port quarter, turning ship 4 points off its course with helm hard against it. It moved approximately 6 to 8 miles per hour, spiraling in force of strong gale, breaking away lifeboat cover stops and lifting light timbers in deck cargo.

## TWO PACIFIC-CHINA AND ONE PACIFIC-JAPAN TYPHOONS IN SEPTEMBER, 1928

By Rev. José Coronas, S. J.

[Weather Bureau, Manila, P. I.]

The most important typhoons of the month of September were two that crossed the great portion of the Pacific from the Ladrone Islands to the China coast and then entered eastern China, and one that moved from the neighborhood of Guam to the central part of Japan. There was not a single well-developed typhoon over the Philippines during the whole month.

*Two Pacific-China typhoons, August 26 to September 15.*—The first of these typhoons was probably formed on August 26 to 27 to the SSW. of Guam near  $143^{\circ}$  longitude E. and  $11^{\circ}$  latitude N. It moved NNW. on the 27th and inclined westward on the 28th and 29th, while its rate of progress was much decreased during these two days. A practically west direction was kept by the typhoon on the 30th of August and 1st of September. In the afternoon of September 2, when the center was about 300 miles to the east of northern Luzon, the typhoon took a northwesterly direction toward Formosa, traversing the northern part of this island during the night of the 5th and early morning of the 6th. A new and very pronounced inclination of the track to the west was noticed on the Formosa Channel; but once in China, the typhoon recurved to the N. and N. by E. on the 7th, the center passing west and northwest of Shanghai in the morning of the 8th.

The approximate positions of the typhoon at 6 a. m. of September 1 to 8 were as follows:

September 1, 6 a. m.  $132^{\circ} 15'$  longitude E.,  $16^{\circ} 30'$  latitude N.  
September 2, 6 a. m.  $128^{\circ} 20'$  longitude E.,  $16^{\circ} 55'$  latitude N.  
September 3, 6 a. m.  $126^{\circ} 30'$  longitude E.,  $17^{\circ} 55'$  latitude N.  
September 4, 6 a. m.  $124^{\circ} 50'$  longitude E.,  $20^{\circ} 00'$  latitude N.

September 5, 6 a. m.  $122^{\circ} 35'$  longitude E.,  $22^{\circ} 20'$  latitude N.  
September 6, 6 a. m.  $121^{\circ} 00'$  longitude E.,  $24^{\circ} 30'$  latitude N.  
September 7, 6 a. m.  $117^{\circ} 45'$  longitude E.,  $25^{\circ} 25'$  latitude N.  
September 8, 6 a. m.  $117^{\circ} 45'$  longitude E.,  $30^{\circ} 00'$  latitude N.

The second Pacific-China typhoon was shown by our weather maps of the 5th and 6th to the northeast of Guam near  $147^{\circ}$  or  $148^{\circ}$  longitude E. and  $16^{\circ}$  latitude N. It moved northwestward until the 9th, when it began to incline to the west about 200 miles south of the Bonins. The steamer *Steel Scientist* was well under the influence of this typhoon to the southeast and south of the Bonins on the 8th and 9th, when very strong winds were experienced from the SE. and S. quadrants. The typhoon moved almost due W. on the 10th and 11th, WNW. and NW. on the 12th, and again westward on the 13th and morning of the 14th. Like the preceding one, it recurved to the north over eastern China and passed west of Shanghai during the night of the 14th. According to press dispatches, "following torrential rains, Shanghai was visited during this typhoon by floods the like of which had not been seen since 1905. Various parts of the international settlement and the French concession were under 18 inches of water. The rainfall during 24 hours was approximately 8 inches."

The approximate positions of the center during the period 8th to 15th were as follows:

September 8, 6 a. m.  $142^{\circ} 30'$  longitude E.,  $22^{\circ} 40'$  latitude N.  
September 9, 6 a. m.  $141^{\circ} 10'$  longitude E.,  $23^{\circ} 50'$  latitude N.  
September 10, 6 a. m.  $137^{\circ} 30'$  longitude E.,  $25^{\circ} 00'$  latitude N.  
September 11, 6 a. m.  $134^{\circ} 10'$  longitude E.,  $25^{\circ} 00'$  latitude N.  
September 12, 6 a. m.  $130^{\circ} 50'$  longitude E.,  $25^{\circ} 05'$  latitude N.  
September 13, 6 a. m.  $125^{\circ} 55'$  longitude E.,  $27^{\circ} 00'$  latitude N.  
September 14, 6 a. m.  $122^{\circ} 50'$  longitude E.,  $28^{\circ} 00'$  latitude N.  
September 15, 6 a. m.  $119^{\circ} 00'$  longitude E.,  $32^{\circ} 30'$  latitude N.

*The Pacific-Japan typhoon, September 18 to 25.*—The first part of this typhoon is rather indefinite, although it is probable that it formed on the 18th to 19th to the southwest of Guam near  $142^{\circ}$  longitude E. and  $11^{\circ}$  latitude N. It moved probably N. or NNW. during the whole track from the 19th until it reached Japan to the west of Tokyo in the evening of the 24th. The center could be seen in our weather maps passing west of the Bonins in the afternoon of the 23d. The storm probably filled up on the 25th over the Japan Sea close to the western coast of Japan.

Besides these three well-developed typhoons, our weather maps showed during the month five other centers of depressions or typhoons over the Far East, but they were either typhoons of an indefinite track or depressions of little importance. There were 3 over the Pacific between the Ladrone Islands and the Philippines, 1 over the China Sea in the neighborhood of the Paracels, and 1 over the Balintang Channel and the southern part of Formosa.